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A TIME-SHARED AUTOMATIC DATA RETRIEVAL SYSTEM FOR MANAGING THE NAVAL ELECTRONIC EQUIPMENT FIELD CHANGE IDENTIFICATION GUIDE

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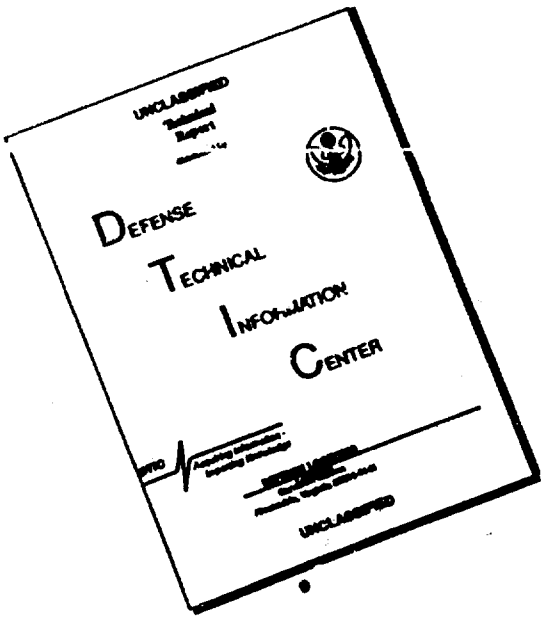

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ABSTRACT

The advent of ADP-controlled production of technical publications has provided all kinds of benefits in the form of cost-effectiveness, efficiency, and accuracy. However, the chief problem encountered in such techniques historically has been the keypunch operation. It requires the use of vendors, with the concomitant problems of cost, transportation, and the conspicuous absence of highly touted accuracies. Also, the increasing usage of Government computer facilities has begun to present problems when a publication with a frequent revision cycle is involved. Taking stock of the foregoing problems, this Section sought some way to solve them. It needed desperately to improve the data acquisition and management system used to publish the electronic equipment Field Change Identification Guide (FCIG) program. Working in conjunction with the NPPS, a new data retrieval system has been adopted to provide a fast-response capability by means of an on-line, time-shared computer in which FCIG data are accessed by an operator terminal located right in the Section office. The flow of input and output data associated with the field change program has become manageable and adapted to a streamlined operation through use of the new system.

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INTRODUCTION

The Electronic Equipment Field Change Identification Guide, referred to as the FCIG, is the single source of identification data for electronic equipment field changes. It consists of six lists of equipment entries, with each list corresponding to a category of electronic equipment (i.e., communications, radar, sonar, test equipment, radiac, and countermeasures). Within each list, equipment entries are arranged alphanumerically by field change number and JAN nomenclature. Figure 1 shows a page from the radar FCIG. Note that the following data are given in a rather succinct format:

- Equipment name
- Field change number
- Title of field change
- Associated publications correction material
- Field change type, funding, estimated hours required to implement it, and the publication number and federal stock number of the field change bulletin
- Serial numbers of equipments affected by the field change
- Identification data

The individual lists are published as separate sections of the equipment-oriented handbooks of the Electronics Installation and Maintenance Book (EIMB) series. These handbooks are revised each quarter, with two handbook revisions being published each month. The FCIG comprises the bulk of each revision package. Thus two of the six FCIG master lists are revised and republished each month.

Coupled with the necessity of frequent, periodic revisions is the requirement that the data be as current as is practicable. These two conditions historically have been difficult to meet because of our total commitment to the sequential-card composition system. This system has a 50 to 60-day production cycle, which means that the published data are around 2 months old when they are received by the Fleet. The solution to this problem clearly lay in developing new procedures for managing the FCIG data program.

DEVELOPMENT CRITERIA

We began an investigation into the problem of developing new procedures with the premise that the best solution lay in some form of automatic data processing (ADP). The Technical Support Branch already had three operational ADP-controlled publications program. These were:

- MIL-HDBK-140 (Security classifications of electronic equipment)
- Weights and Vertical Centers-of-Gravity Reports
- Handbook of Manufacturers Designating Symbols

Branch personnel were well indoctrinated in the use and capabilities of ADP devices to control and maintain publications which require frequent updating. However, even with the improvements realized by changing from conventional data handling techniques to ADP techniques, two problems developed which soon became the limiting factors in producing publications that are revised frequently. The problems are associated with keypunching-keyverification and the "turn-around" time. The FCIG data must be updated frequently, and the data for a given revision must be the latest information that can be obtained prior to the revision "freeze date." Consider first the impact on these requirements by the keypunching-keyverification problem. The data must be transcribed onto 80-column keypunch transmittal forms. The forms are forwarded to the NAVMAT ADP support activity, which in turn sends the data to a vendor for keypunching and keyverification. After any errors detected during verification are corrected, the ADP support activity prepares a paper printout and sends it to the originator for a brief review of the material. Any errors discovered at this stage necessitate going through the entire cycle again. A typical cycle is approximately 1-1/2 weeks in duration. Although this period of time doesn't sound excessively long, it represents only a 2-week decrease in the time required in the sequential-card composition technique.

The long "turn-around" time is increased further by heavy workloads and manpower shortages in the NAVMAT ADP support activity.

Even the advent of higher-speed computing machinery has not substantially alleviated the problem. Thus we have a situation such as this: we continually obtain new and faster data processing machinery, but we are constantly constrained by the limitations of peripheral equipment, manpower shortages, involved procedures, and such. The situation is similar to the air transportation riddle: "Why is it that we can fly from coast to coast at increasingly higher speeds, yet it takes longer and longer to drive across town just to get to the airport?"

Thus the problem here was defined in terms of finding a way to avoid the keypunch operation, if possible, and to reduce the turnaround time. Working on this problem with the Navy Publication and Printing Service, we have found a system which offers a solution.

THE ADMINISTRATIVE TERMINAL SYSTEM

The Administrative Terminal System (ATS) was developed by IBM and consists of a 1440 computer and a number of time-sharing terminals for inputting and outputting data. Figure 2 shows the configuration of the system. Data are entered into disk storage in the IBM 1440 computer via a dataphone line. The keyboard is a conventional IBM Selectric typewriter with an additional key to signal the computer. The ATS terminal and dataphone are located in the Main Navy Building, and the computer is located on the downtown premises of the contractor, the VIP Systems Corporation.

The terminal operator, a Government clerk-typist, can enter data into the computer; access the data; make corrections, additions, or deletions; and reformat the data. The data when retrieved are printed out in upper and lower-case letters and, at the operator's option, can be right-justified text. The operator proofreads the data from the copy made at the terminal while the data were being inputted. Any errors are spotted quickly and corrected immediately. Thus keypunching and keyverification have been eliminated. The data are always accessible for retrieving and, using the ATS as an output device, the operator can rapidly (150 words per minute) prepare high-quality, photolithographic reproducibles.

THE FCIG WORKFLOW

Figure 3 shows the sequence of events associated with the flow of data in the FCIG program. The first data product is normally a manuscript of the field change instructions — either a field change bulletin or a "paper" field change for publication in the Electronics Information Bulletin or other media. The manuscript is forwarded by the engineering activity to the Technical Support Branch where the printout of the FCIG master file is maintained. (Actually there are six master files — one for each equipment category.) The latest field change number is determined from the printout and affixed to the field change manuscript. If any question or confusion exists, the computer can be interrogated by means of the ATS terminal. If the field change publication is to be a field change bulletin, then

a NAVSHIPS publication number is requested and entered on the manuscript. The photolithographic reproducibles are now prepared. If the end product is a field change bulletin, the reproducibles are distributed and stocked via the supply system. If the end product is an EIB-propagated field change, the information is composed for publication in the EIB. After the field change appears in the EIB, it is extracted, assigned a NAVSHIPS publications number and stocked in the supply system.

The field change information is then placed in the FCIG format and transferred to the proper place in computer storage via the ATS terminal. By entering these data on an "as-arrived" basis, the FCIG master files are kept up to date. As new field change numbers are assigned, the new numbers are annotated on the master file printouts. At some time interval, new printouts will be requested at which time the old ones will be discarded.

PREPARING AN FCIG REVISION

The current production plan for the FCIG utilizes the ATS terminal as an input device only. Preparation of an FCIG revision begins with accessing the document number for the proper master subfile and print instructions (Figure 4). The contractor then prepares a magnetic tape of the proper FCIG master file (the internal 1440 storage is magnetic-disk). Then it is necessary to prepare a paper tape for the Photon equipment. This equipment, a photocomposition device, decodes the punched paper tape and records the decoded data onto photographic paper. The finished product is a multiple-type-font galley of high photolithographic

quality. Figure 5 shows a page from the Test Equipment FCIG. Note the bold type for the equipment nomenclature. The galley has been "pasted up" to obtain a 2-column format. Figure 6 shows a portion of the input data for the same page. The degree symbols superimposed on the "A" of the nomenclature line and on the colon are codes for the Photon to indicate a change in type font. The reproducible mechanicals, in 2-column format, are sent to the printer and distributed via the supply system.

Other options (not illustrated) are available. The magnetic tape can be processed in other computerized photocomposition devices such as the Stromberg-Carlson 4020 and the Morgenthaler Linotron. If desired, the ATS terminal can also be used as an output device. The data printout would be of photolithographic quality and would be used to prepare reproducible mechanicals.

CONCLUSIONS

The Administrative Terminal System is a truly flexible system. It provides close technical control over the data inputting, maintenance, and retrieval. It precludes the red tape involved with many conventional inhouse ADP procedures. It precludes the entire keypunching operation. Finally, it assures that the data are "purified" prior to storage and subsequent retrieval. The over-all FCIG is already in computer storage and we are applying our efforts toward further "purification" of the data each time we go to press. The ATS has proved itself a valuable

data management tool which in one compact, economical package offers some solutions to the problems that all of us in the data management business experience.

11-AN/TPS-1B - MX-834/TPS-1B repl ant. drive kit
Correction material: TM for MX-834/TPS-1B, NS 91250
1-A FA-5 NS98137 None
SERIAL: All
IDENTITY: PPI Connector in plate above PPI Reptr synchro nameplate.

12-AN/TPS-1B - MX-836/TPS-1B elect mot drive for PU-51/TPS-1B
Correction material: TM for PU-51/TPS-1B, NS 91067
1-A FA-5 NS98074 F5840-332-5166
SERIAL: All
IDENTITY: Electric motor driver generator of power unit PU-51/TPS-1B

4-AN/TPX-18A - Same as 1-AN/TPX-18

1-AN/UPA-1B - Nom chg for 120 and 51 dummy loads
Correction material: None
A FA-½ NS98823 F6625-508-1412
SERIAL: All
IDENTITY: Nameplates for dummy loads will be DA-16A/U and DA-129/U

1-AN/UPA-22 - Drive mot. repl carbon brg (0-229) with ball brg
Correction material: T-1 to NS 91516(A)
2-A FA-2 NS98330 F5985-318-7021
SERIAL: All
IDENTITY: Replacement of carbon bearing with ball bearing and addition of upper and lower retaining rings in motor shaft.

2-AN/UPA-22 - Cancelled

3-AN/UPA-22 - Pwr rect ckt, rewire
Correction material: None
2-A FA- NS981079 None
SERIAL: All
IDENTITY: Jumpers are removed from tube sockets XV-404 and XV-405

1-AN/UPA-23 - Same as 1-AN/UPA-22

2-AN/UPA-23 - Cancelled

3-AN/UPA-23 - Same as 3-AN/UPA-22

1-AN/UPA-24 - Hi-V reset sw and ind, add
Correction material: T-2 to NS 92119(A)
2-A FA-2 NS98[illegible] None
SERIAL: All
IDENTITY: Press to reset H.V. overload button added to front panel of radar set control unit C-1008/UPA-24 directly below and centered between selector switches.

2-AN/UPA-24 - Cancelled

3-AN/UPA-24 - Add wiring required for AN/UPA-24 used with AN/SPA-51 and AN/SPS-32
Correction material:
2-A FA-1/2 NS981212 None
SERIAL: All AN/UPA-24 is used with AN/SPA-51 and AN/SPS-32
IDENTITY: Energizing of relay K4201 in Electronic Gate TD-326/SP (part of AN/SPA-51) when the challenging switch S701 on Set Control C-1008/UPA-24 is at either the "ON" or "LOCK ON" position.

4-AN/UPA-24 - Replace video mixer (300 series) sub-assembly
Correction material: TM - NS94257; MSP-NS94257.42; PSS - NS94257.32 for AN/UPA-24
1-A FA-1S NS981391 F5840-856-7[illegible]
SERIAL: All
IDENTITY: Presence of new nameplate on video decoder.

1-AN/UPA-38 - Improve Safety Conditions (Drawer Stop for KY-136/UPA-38)
Correction material: None Required
2-A FA-1
SERIAL: All
IDENTITY: Presence of a drawer stop consisting of a 2-1/2-inch steel pin inserted into a hole drilled at the end of the drawer rail about 1/4 inch from the roller of the KY-136/UPA-38

2-AN/UPA-38 - Replacement of Resistors.
Correction material: T- to NS.
2-A FA-1 NS None
SERIAL: All.
IDENTITY:

1-AN/UPA-43 - Addition of Relay to Deenergize Antenna Pedestal Group when Reference Voltage is Removed.
Correction material: NS 94927.
2-A FA-4 NS None
SERIAL: All.
IDENTITY: Presence of a relay between TB6004 and TB6002.

1-AN/UPM-70 - Reduction of Shock Hazard.
Correction material: None
2-A FA-1 NS981[illegible]56 None
SERIAL: All.
IDENTITY: Mounting of R-428.

2-AN/UPM-70 - Modification to Prevent Circuit Tube [illegible] M-609
Correction material: T-4 to NS 9[illegible]
2-A FA-1 NS94[illegible] None
SERIAL: [illegible]
IDENTITY: Metal connection to [illegible] agrees with Figure 7-31 of Technical Manual [illegible]

Figure 1. Sample Page from Radar FCIG.

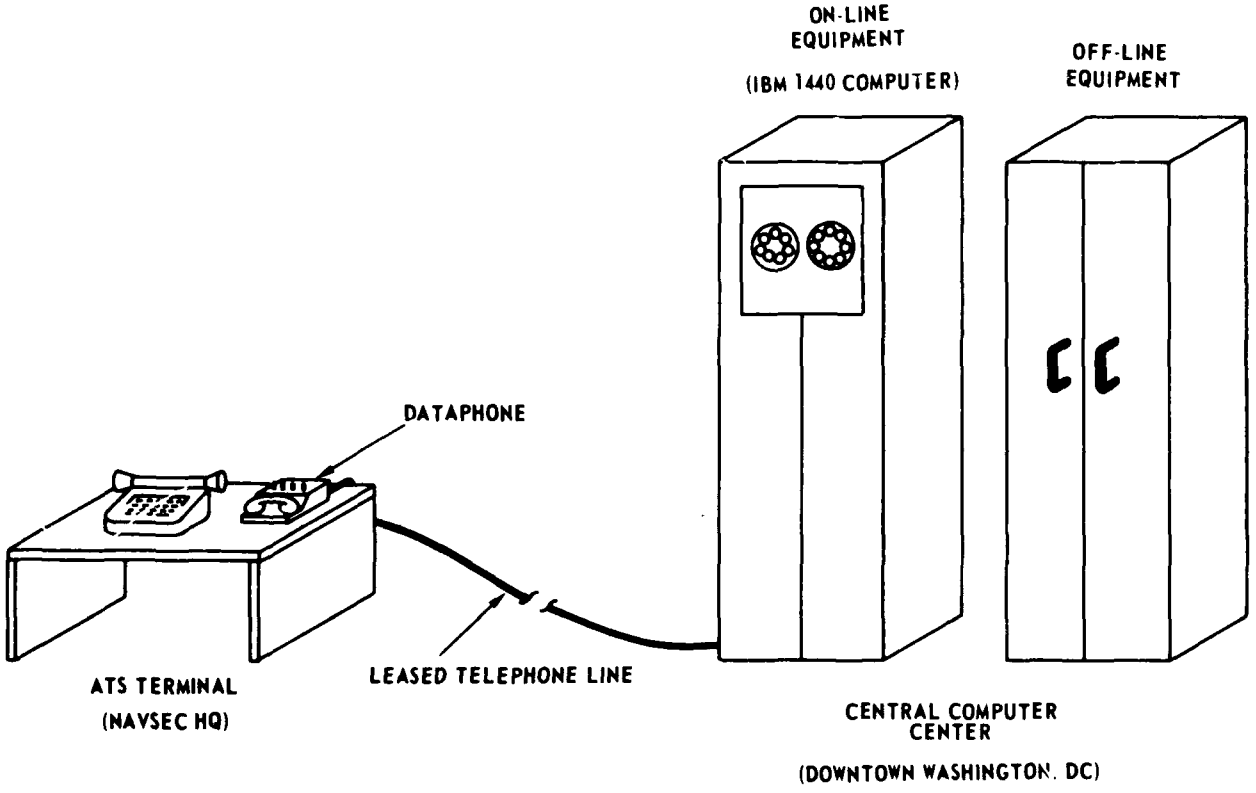

Figure 2. ATS System Block Diagram

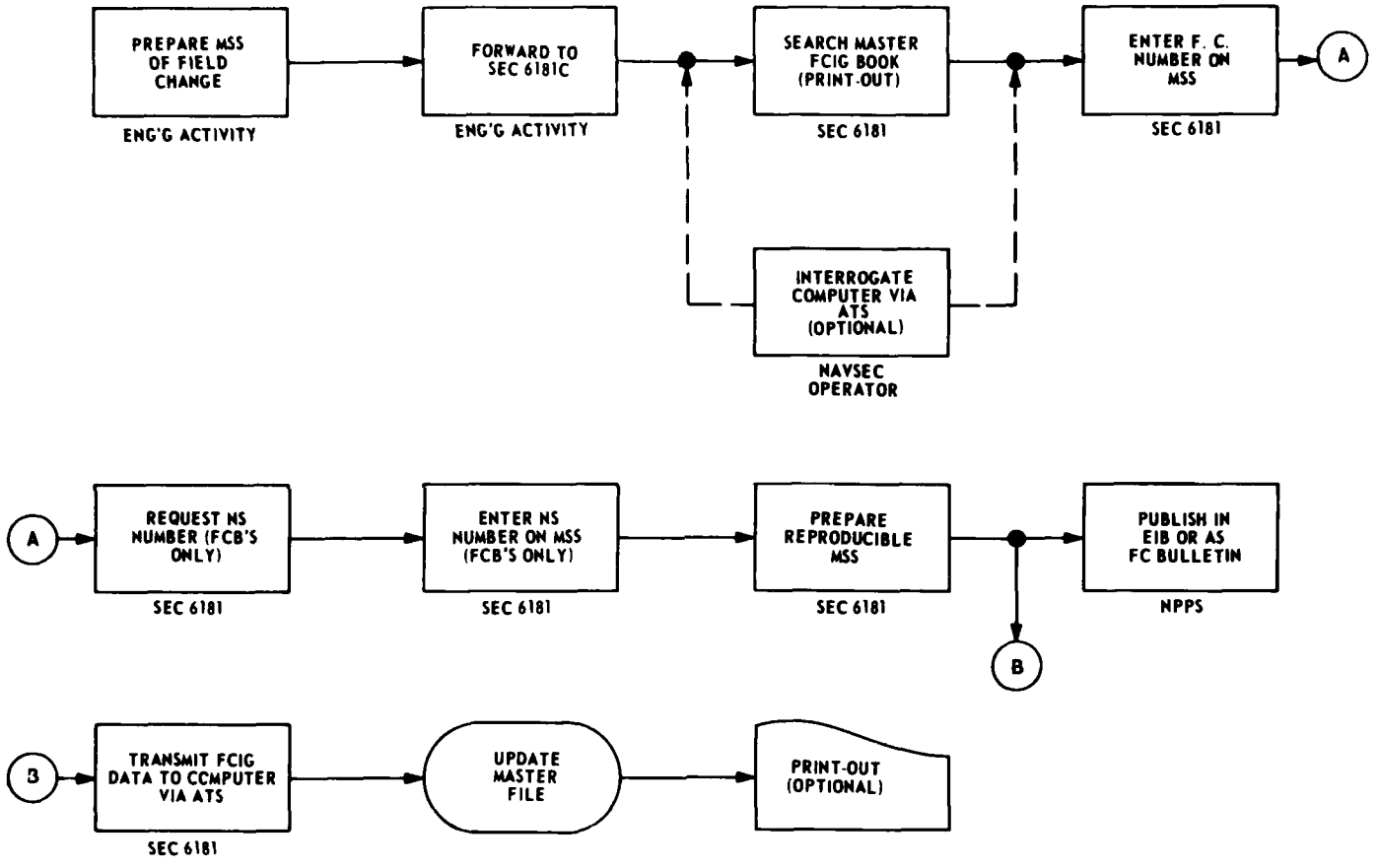

Figure 3. FCIG Data Flow Diagram.

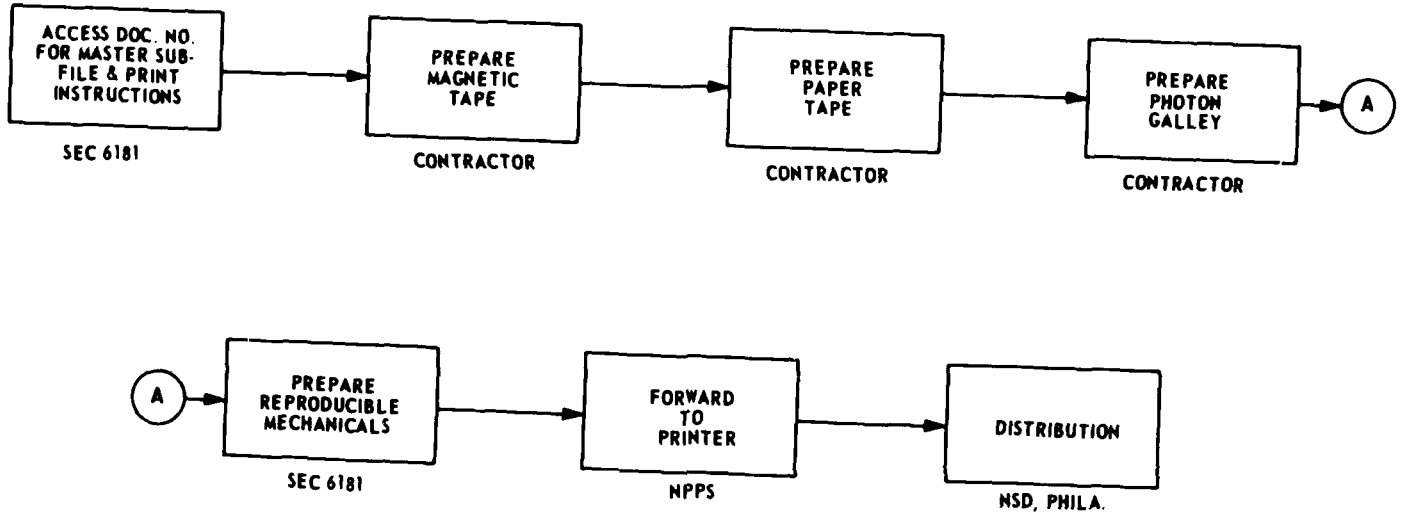

Figure 4. FCIG Revision Procedure.

1-AN/UPM-1B: Power fuse change
A FA-1/2 NS98779 F5840-695-0169
SERIAL (CIH) 1201-1421
IDENTITY The 5 amp fuses are replaced with 3 amp fuses

2-AN/UPM-1B: Antenna assy. incorrect
A FA-3 NS98779 None
SERIAL (CIH) 1201-1422
IDENTITY Disconnect any cable going to the ant Check continuity between the two quarter-wave elements by touching one lead to the outer shell of the coaxial connector in the base of the ant. There should be no continuity. If continuity exists, field change has not been performed Recheck as before.

3-AN/UPM-1B: Same as 3-AN UPM-1 - except
SERIAL (CIH) 1201-1335

4-AN/UPM-1B: Same as 4-AN/UPM-1 - except
SERIAL (CIH) 1201-1202

1-AN/UPM-2: Crystal replacement
Correction material See NS98780
A FA-1-4 NS98780 None
SERIAL All
IDENTITY The 7 1N21 crystals are replaced with IN25 crystals 2 crystals are in wavemeter, 5 crystals are in the lid of carrying case

1-AN/UPM-4A: Conversion to provide Mark 10 SIF test capability
Correction material TM for AN/UPM-99, NS93520
2-B YF-80 NS981141 F5840-586-0825
SERIAL All
IDENTITY Modifies equipment designation to AN/UPM-99

1-AN/UPM-6A: Electron tube contact, repl
Correction material to NS91467(A)
A FA-1 NS98284 F6625-301-9582
SERIAL 1-219, 221-640, 688-872
IDENTITY Electron tube contact replaced with Hazeltine Part No SP-10123-B

1-AN/UPM-6B: Same as 1-AN/UPM-6A

2-AN/UPM-6B: Modif for use w/KY-137/UPA-39
Correction material T-3 to NS91467(A)
B YF-4 NS98506 F5840-311-3284
SERIAL All
IDENTITY Adds new "video out, mod in" jack to the left of the attenuator dial

1-AN/URM-25D: Procedure for Grounding the AN/URM-25D through the Power Receptacle
Correction material None
2-A FA-2 NS981675
SERIAL All which employ a two-conductor power cable and have no provisions for grounding the equipment
IDENTITY Substitution of the two-conductor power cable with a three-conductor grounded type cable

2-AN/URM-25D: Protective Cover for Capacitors C168 and C169
Correction material None
2-A FA-3 None
SERIAL ALL
IDENTITY Presence of an extended cover over capacitor tips C168 and C169

1-AN/URM-26A: Procedure for Obtaining Pulse Modulation
Correction material NS91973,42
2-A FA None
SERIAL
IDENTITY

1-AN/URM-26B: Improving External Modulation
Correction material T- to NS92890
2-A FA- None
SERIAL Equipments Produced under NObsrs-85408, 57537, 71785, 59607, 75368, 75745, 75905, 81404 and 87368.
IDENTITY

1-AN/URM-43: Securing Crystal Holders
Correction material None
2-A FA-1 None
SERIAL AN/URM-43 (or ME-11/U) series that are not spring loaded or have no device for securing the crystal holder

1-AN/URM-43A: Replacement of scale selector switch S-101 on wattmeter ME-11/U for easier calibration
Correction material T1 to NS91842
2-A FA-1/2 NS981239 None
SERIAL All
IDENTITY Substitution of SPDT Switch with a DPDT Switch

Figure 5. Sample Page of Test Equipment FCIG Produced by ATS-Photon System.

1-AN/DSM-4? Incorporation of DC Firing Circuit in Missile Starting and Launching Console Model CA-663/DSM-4. 7
Correction material: T- to NS
1-A TA-60 93572
SERIAL: 1 thru 6
IDENTITY: Field change nameplates installed on front of console

1-AN/FSM-5A? Replacement of Type 5696 Tubes with Type 5727/2D21W
Correction material: T-1 to NS 91327(A)
1-A TA-8 98914 None
SERIAL: All
IDENTITY: Type 5696 tubes replaced with 5727/2D21W

1-AN/PSM-1? BFO, install
Correction material: Change 1 to NS 91255
A TA-4 NS98272 F6625-642-5991
SERIAL: 1-220
IDENTITY: BFO toggle switch on front panel

1-AN/PSM-1? Conversion of ZM-13/PSM-1 and ZM-14/PSM-2 Insulation Test Sets from Vacuum Tube to Selenium Rectification 25
Correction material: to NS 91430
2-A TA-4 None
SERIAL: ZM-13/PSM and ZM-14/PSM-2 which are part of AN/PSM-1, -2
IDENTITY: Selenium Rectifier in place of Vacuum Tube.

1-AN/PSM-2? Same as 1-AN/PSM-1

1-AN/PSM-4? Cancelled

1-AN/PSM-4A? Cancelled

1-AN/SPM-13? Electronic Plug-In Test Set - Incorporation of Factory Modification Bulletin No. 1 as a Field Change 37
Correction material: To be furnished as a permanent Change to NAVSHIPS 95757. 38
2-A TA
SERIAL: All thru 232
IDENTITY:

2-AN/SPM-13? Remounting Jack J51
Correction material: None required
2-A TA-1
SERIAL: Equipments built under Contract NObsr 25693 (B2 thru B7)
IDENTITY: Observing that the silk screening underneath the top panel for Jack J51 has been removed. 47

Figure 6. Portion of Data Given in Fig. 5, Shown in Input Format.